PATENTS ACT 1977

A10389GB-GMD

Title: Wheelchairs and Structural Elements Therefor

Description of Invention

This invention relates to wheelchairs, and to structural elements suitable for and intended to be incorporated in wheelchairs. However, in being thus suitable, it will be appreciated that elements in accordance with the invention may find other applications.

The invention has been devised in relation to wheelchairs which are adjustable to enable them to be utilised by persons of different sizes. A particular requirement for adjustment arises if a wheelchair is intended to be used for a child, in which case the size of the chair needs to be increased as the child grows. Whilst it is practically impossible for a single size of wheelchair to cope with a range of sizes of user from a small child to an adult, adjustability of the chair enables use of a single chair possibly for a number of years before another basic size of chair has to be used.

As well as being adjustable in respect of its width, a chair in relation to which the invention has been devised is able to be folded from its operative condition to a condition in which the two sides of the wheelchair are disposed more closely together so that the chair occupies less space. This makes it easier to store or transport the wheelchair when it is not occupied.

To enable such folding of the wheelchair from its operative condition, the wheelchair in relation to which the invention has been devised comprises two side frame structures which carry the wheels of the chair, each side frame structure including an upper rail member and a lower rail member extending forwardly and rearwardly of the wheelchair and substantially parallel to one another, and a cross-brace assembly including first and second cross-brace members pivotally connected to one another between their ends by a pivot

means, each of the cross-brace members being pivotally connected at a lower end with a respective side frame lower rail member and being connected at an opposite upper end with a seat supporting member, and respective links pivotally connected between the cross-brace members and respective upper rail members of the side frame structures. To provide the adjustable width of the wheelchair, the cross-brace members are adjustable in length and the links are also adjustable in respect of the length thereof pivotally connected between the cross-brace members and upper rail members of the side frame structures.

Two aspects of the present invention have been developed in relation to the construction of the side frame structures and of the cross-brace assembly of a wheelchair as above set forth. However it will be appreciated that structural assemblies in accordance with the invention may be usable in other situations where similar or analogous requirements arise.

A wheelchair is known wherein each side frame structure comprises rail members which are of tubular metal, joined at front and rear by spaced upright members in the form of mouldings of a plastics material. Such upright members at the front of the wheelchair provide for supporting the respective front wheels, usually castor wheels, of the wheelchair and also providing for the support of footrests, leg rests, and/or other devices which commonly are found at the front of wheelchairs. The upright members at the rear of the wheelchair carry the rear wheels, handles/seat backrest, and other associated items. The rail members, which are circular in external cross-sectional shape, engage as a close fit in correspondingly-shaped receiving formations in the upright members, and are held therein by fasteners extending transversely of the upright members and diametrally through the rail member parts received therein. The circular external cross-sectional shape of the rail members is, of course, convenient for pivoting of the cross-brace members and the links of the cross-brace assembly thereabout, but has a disadvantage in that the connections with the upright members might become slightly less than fully tight and rigid

over an extended service life. In particular "working" of the fastener passing through the rail member and the part of the moulded plastics upright member which receives it might permit the rail member to twist about its longitudinal axis within the receiving formation.

According to one aspect of the present invention, therefore, we provide a structural assembly comprising an elongate member engaged in a receiving formation of a receiving member, wherein said elongate member has an external cross-sectional shape which is non-circular and includes circumferentially spaced portions of a circumscribing circle, and the receiving formation is of an internal cross-sectional shape which cooperates at least with the remaining portions of said external cross-sectional shape of the elongate member, to prevent relative movement between the receiving member and elongate member about the longitudinal axis of the latter.

Preferably the cross-sectional shape of the receiving formation is the same as the external cross-sectional shape of the elongate member. In this case contact is established around the entire periphery of the part of the elongate member engaged in the receiving formation, providing a secure connection resistant to twisting of the elongate member in the receiving formation.

Whilst in some situations sufficient security of the connection might be provided by an interference fit between the elongate member and the receiving formation of the receiving member, preferably there is fastening means for fastening the members together. Such fastening means may comprise a fastener such as a bolt, rivet or the like, extending transversely through the receiving formation and the elongate member, or as the assembly is used elsewhere may include clamping means embracing the receiving member to clamp the elongate member in the receiving formation, further with a locating element engaging the elongate member and receiving member to ensure correct relative positioning therebetween in the direction lengthwise of the elongate member.

As applied to a wheelchair, an assembly according to the first aspect of the invention may find application in the connections between the upper and lower rail members of the side frame structures thereof, and the front and rear upright members by which the rail members are assembled to form the side frame structures. In this case, the cross-brace members where they are pivotally connected to the lower rail members and the links where they are pivotally connected to the upper rail members are provided with engagement members or formations which cooperate with the circumferentially spaced part-circular portions of the exterior of the rail members.

Thus the security of connection between the rail members and upright members is achieved as aforesaid, while pivoting of the cross-brace members and links about the rail members is also provided for.

A further aspect of the invention has been devised in relation to the cross-brace members and in particular to the adjustability thereof, although a structural assembly in accordance with this aspect of the invention may be usable in other situations where similar or analogous requirements arise.

A wheelchair is known wherein each cross-brace member comprises a central portion and respective end portions one of which is pivotally connected to a side frame lower rail member and the other of which forms a seat supporting member. The central portions of the two cross-brace members are pivotally connected together. The length adjustment of each cross-brace member is achieved by telescopically engaging the central portion with the seat supporting member and pivotable member, and securing them together in each case by a fastener extending transversely through the respective member and central portion. A row of apertures for receiving the fastener enables the cross-brace member to be set to the required length and fixed thereat by passing the fastener through the appropriate apertures. This is largely satisfactory, but it is broadly a further object of the invention to provide an improved connection at this point.

According to another aspect of the present invention, we provide a structural assembly comprising an elongate member engaging in a receiving formation of a receiving member, and clamping means embracing said receiving member to clamp the elongate member in said receiving formation, wherein said clamping means includes a locating element cooperating with respective formations in the elongate member and receiving member to position the elongate member in the direction of its length relative to the receiving member.

Preferably said formations comprise an aperture in the receiving member and an aperture or recess in the elongate member, said locating element extending radially inwardly through the aperture in the receiving member to engage the recess or aperture in the elongate member.

Preferably there is a row of said formations in the elongate member, spaced lengthwise thereof to permit adjustability in the position of the elongate member relative to the receiving member.

Preferably the locating element comprises a nose portion of a fastener by which the clamping means is tightened.

According to yet another aspect of the invention, we provide a cross-brace member for a wheelchair incorporating at least one structural assembly according to the above aspect of the invention, provided between an elongate member constituting a part of the cross-brace member pivotally connected to another cross-brace member in use and a seat supporting member and/or a pivot member constituting the receiving member.

The invention will now be described by way of example with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of part of a wheelchair in accordance with the invention, showing the cross-brace assembly thereof;

Figure 2 is a perspective view of one of the side frame structures of the wheelchair, showing the disposition of the wheels thereof;

Figure 3 is an exploded perspective view of part of the side frame structure of Figure 2;

Figure 4 is an exploded perspective view of a further part of the side frame structure of Figure 2;

Figure 5 is an exploded perspective view of yet a further part of the side frame structure of Figure 2;

Figure 6 is a perspective view showing the front wheel mounting of the wheelchair;

Figure 7 is a side elevation of the front wheel mounting;

Figure 8 is an exploded perspective view of a seat-supporting member of the wheelchair;

Figure 9 is an exploded perspective view illustrating part of the wheelchair's seat in relation to the member of Figure 8;

Figure 10 is a perspective view of part of the cross-brace assembly of the wheelchair;

Figure 11 is an exploded view of the part shown in Figure 10.

Referring firstly to Figures 1 and 2 of the drawings, these show part of a wheelchair comprising two side frame structures indicated generally at 10, 11 spaced laterally of the wheelchair from one another. Each side frame structure carries one front wheel and one rear wheel of the wheelchair: Figure 2 shows the front wheel 12 which is a castor wheel and the rear wheel 13 which is a large diameter wheel having a driving rim 14 for manual manipulation by an occupant of the wheelchair for propelling the chair. The mounting of the wheels 12, 13 to the relevant parts of the side frame structure will be described in greater detail hereafter. The side frame structures are joined by a cross-brace assembly indicated generally at 15 and which also will be described in greater detail hereafter.

The side frame structures 10, 11 are mirror images of one another, the structure 10 comprising an upper rail member 16 and a lower rail member 17

extending parallel to one another or substantially so and forwardly and rearwardly of the wheelchair. They are joined at the front of the wheelchair by a front upright member 18 and at the rear of the wheelchair by a rear upright member 19. The upright members are mouldings of a suitable structural plastics material and as seen in more detail in Figure 3 the front upright member 18 comprises a lower body portion 19, an upper body portion 20 and an intermediate upwardly extending portion 21 therebetween. The body portion 19 has at its front an upwardly facing socket 22 for co-operation with e.g. a footrest of the wheelchair and a rearwardly extending portion 23 for attachment of a bracket 24 for mounting wheel 12. A socket 25 opens at the rear of the lower body portion 19, to receive lower rail member 17.

The upper body portion 20 also extends rearwardly from the top of intermediate portion 21 and at its upper surface has a saddle formation 26 for supporting one end of a seat-carrying member to be described hereafter. A boss portion 27 extends rearwardly on the saddle 26 and has a rearwardly facing socket for reception of upper rail member 16.

The upper and lower rail members 16, 17 are of tubular metal preferably an aluminium alloy. The external cross-sectional shape of the rail members is the same as one another, and is non-circular comprising four equally circumferentially spaced arcuate portions 30, 31, 32, 33 joined by four flat portions 34, 35, 36, 37 which are parts of side of a square. The arcuate portions 30 to 33 form respective parts of a circumscribing circle: the cross-sectional shape can be considered to be a square but with its corners removed and replaced by part circular portions. The tubular rail member has approximately constant wall thickness, and preferably is an extrusion.

The sockets 28, 25 in which the upper and lower rail members 16, 17 respectively fit are of the same internal cross-sectional shape as the external shape of the rail members, and receive the latter as a tight fit. A transverse fastener passing through the rail member and body portion 20 where indicated

at 39 holds the top rail member, while a transverse fastener (referred to hereafter) extending through an aperture 40 in the body portion 19 and a corresponding aperture (not shown) in the lower rail member 17 secures the latter.

The configuration of the rear upright member 19 and the associated parts by which the rear wheel 13 is mounted thereto is seen most clearly with reference to Figures 4 and 5. The member 19, which is a moulding of a structural plastics material, comprises a tubular upright body 50 at the bottom of which and extending transversely of the body 50 is a body portion 51 defining a through-extending receiving formation in the form of a socket 52 for receiving the lower rail member 17. The internal cross-sectional shape of the socket 52 corresponds to the external cross-sectional shape as above described of the lower rail member. Towards the top of the body 50, a body portion 53 defines a transverse through-extending receiving formation in the form of a socket 54 for receiving the upper rail member 16. The internal cross-sectional shape of the majority of the length of the socket 54 corresponds to the external cross-sectional shape of the rail member 16, although at its ends the socket 54 does not completely embrace the rail member. The body portion 53 further defines an open-topped supporting recess 55 for receiving an end of the seat-supporting member described hereafter. The body portion 53 also defines an upwardly facing socket formation 56 and above the body portion 53 the body 50 continues to define a socket formation 57: the socket formations 56, 57 provide for attachment of other wheelchair parts which may include handles, seat backrest structure, armrest structure, and so on.

An axle on which a hub 59 on rear wheel 13 is rotatably supported is carried by an axle-mounting member 60 which is secured to the rear upright member 19 in either of the two orientations 60a and 60b in which it is depicted in Figure 5. In Figure 4 it is in its orientation 60b. The member 60 comprises two spaced parallel plate portions 61, 62 joined by a spacer block 63 and when

secured to the member 19 the plates 61, 62 lie on respective opposite sides of the portions 51, 53 of the member 19. Fasteners such as bolts, not shown, pass through aligned apertures as indicated at 64 in the plate portions 61, 62 and as indicated at 65 in the body portions 51, 53, and also pass through apertures not shown in the rail members 16, 17 therefore fastening the rail members as well as the wheel mounting member.

The axle member, not specifically shown, on which hub 59 of wheel 13 is rotatably supported is passed through and fixed in a selected one of a number of vertically spaced transversely extending apertures 66 in the wheel mounting 60. Thus the wheel can be mounted as a selected one of a range of heights relative to the wheelchair, and in a relatively more forward or rearward disposition according to the orientation in which the wheel mounting member is secured.

Referring now to Figures 6 and 7 of the drawings, these show in greater detail the arrangement by which a front wheel 12 is mounted on the wheelchair. The front wheel mounting bracket 24 has a lug portion 70 which carries, for pivotal movement about a castor swivel axis, the front castor wheel 12 and the lug extends from a somewhat sector shaped body part 71 with a flat surface facing the body portion 23. The body part 71 has a row of apertures 72 in arcuate disposition centred on an aperture 73 through which extends a fastener 74 by which the bracket 24 is secured to the body portion 23. The fastener 74 also passes through a transverse aperture 40 in the body portion 23, so this fastener also serves to secure the lower rail member 17 in the socket 25 in the body portion 23. Centred on the aperture 40 in the body portion 23 there is a row of apertures 75 in arcuate disposition. The apertures 75 are uniformly spaced from one another but such spacing is different from the spacing of the apertures 72 from one another: over a similar length of arc there are seven of the apertures 75 and eight of the apertures 72.

The effect of such disposition of the apertures 72, 75 is that the inclination of the castor swivel axis of the castor wheel 12 can be adjusted in small increments of e.g. 1.5°, by loosening the fastener 74, pivotally moving the support bracket 24, and passing a selected fastener through whichever ones of apertures 72, 75 align with one another when the castor swivel axis inclination is as desired. Serrations 76 in the region of the apertures 75 co-operate with a protruding formation or formations in the region of the apertures 72 so that a set inclination will be held to some extent even before a fastener is passed through whichever apertures align with one another.

Referring again to Figure 1 of the drawings, the cross-brace assembly 15 comprises first and second cross-brace members 80, 81 which are pivotally connected to one another between their ends by a pivot means. Each is connected at one end (its lower end) to a respective side frame lower rail member and at its other, upper end carries a seat supporting member. The cross-brace member 80 comprises a metal tubular portion 82 which at one end is connected to a moulded plastics pivot member 83 pivotable about the lower rail member 17, extending through a part of the pivot member 83 of cylindrical internal cross-section. The opposite end of the tubular part 82 is connected to seat supporting member 84 described in greater detail hereafter. Similarly the cross-brace member 81 comprises a metal tubular portion 85 connected to a moulded plastics pivot member 86, pivotable about the lower rail member of the opposite side frame structure 11, and to a seat-supporting member 87. The two cross-brace members are pivotally connected to one another by a pivot pin or bolt passed through apertures as indicated at 88 in their tubular portions 82, 85. Finally the cross-brace assembly comprises respective links 89, 90 which are pivotally connected to the respective cross-brace members in the region of the seat supporting members, and further are pivotable about the respective upper rail members of the side frame structures. This arrangement of cross-brace assembly permits the wheelchair to be folded or collapsed from its

operative condition as shown in Figure 1 of the drawings to a condition in which the two side frames of the wheelchair are disposed more closely together so that the chair occupies less space. It will be noted that in the operative condition opposite ends of the seat supporting members 84, 87 are received in the saddle formations as 26 and recesses as 55 of the upright members of the side frame structures of the wheelchair.

The cross-sectional shape of the tubular metal portions 82, 85 of the cross-brace members is the same as that of the rail members as 16, 17 of the side frame structures of the wheelchair (although the size may be different), and fits in receiving formations of corresponding internal cross-section in the moulded plastics pivot members 83, 86 and the seat supporting members 84, 87 so that a firm connection is achieved therebetween. The pivot members 83, 86 engage the arcuate surface portions 30 to 33 of the lower rail members of the respective side frames, and the links 89, 90 co-operate with the arcuate surface portions of the upper rail members of the respective side frames for pivotal movement thereabout. Thus it will be appreciated that a common cross-section of metal tube is utilised which provides both for a rigid connection where required between it and moulded plastics components such as the front and rear upright members of the side frames and the pivot members and seat supporting members of the cross-brace assembly, and also provides for pivoting about the tubes where required.

Referring now to Figures 8 and 9 of the drawings, these show in further detail a seat-supporting member 84 or 87. The member, which is a moulding of a suitable plastics material, comprises a body portion 100 and, extending transversely of the body portion 100 at an end thereof, a seat-supporting portion 101. At the opposite end of the body portion 100 a receiving formation extends into the body portion in the direction of the longitudinal axis thereof, such a receiving formation or socket being of a cross-sectional shape to receive the tubular portion 82 or 85 of the cross-brace member. Such end of the body

portion is formed as a split clamping portion 102 to be embraced by a clamping means and tightened to grip the tubular portion of the cross-brace member when received therein. Adjacent the portion 102, two bracing web structures 103, 104 extend obliquely to regions near the opposite ends of the seat supporting portion 101.

The seat supporting portion 101 is hollow cylindrical in configuration with a longitudinal slot 105 extending throughout its full length. This enables the seat supporting portion to co-operate with one side of a seat assembly 106 which is a panel of a suitable strong and flexible fabric at whose edge 108 it is folded back upon itself and stitched or otherwise secured to afford a tubular boundary portion 109 to receive a metal supporting rod or tube 110. With the rod 110 inserted into the tubular boundary portion 109 of the seat, this can be inserted endwise into the seat supporting portion 101 with the fabric panel emerging from the slot 105. Thus the fabric panel constituting the seat is firmly secured to the seat supporting member since the edge thereof containing the supporting rod cannot be pulled through the slot 105. The dimensions of the rod are such that with the seat fabric therearound it is a close fit within the interior of portion 101, so that although the seat supporting member is of moulded plastics material it is braced and rendered substantially rigid by the rod 110 when the seat is fitted. To prevent the seat from being removed endwise from the portion 101 of the seat supporting member, end caps 111, 112. These are snap fitted to the ends of the portion 101; protruding tabs as 113 are shown on the latter, engaging in openings as 114 on a part of the end cap embracing the end of the portion 101. In end cap 112 there is shown a circular boss portion 115 which fits inside the end region of the portion 101. The length of the seat may be less than the length of the portion 101, and the seat appropriately positioned in the direction of the length of the portion 101 (i.e. forwardly and rearwardly of the wheelchair) by selection of end caps having bosses as 115 of suitable length.

Referring finally now to Figures 10 and 11 of the drawings, this shows one of the pivot members 83 or 86 by which one of the cross-brace members is pivotally connected to one of the lower rail members of the wheelchair. This comprises a body portion 120 and a transversely extending portion 121 at whose ends there are aligned hollow cylindrical portions 122, 123 within which a through-extending lower rail member is supported for relative pivoting movement. Bracing web structures 124, 125 extend from the portions 122, 123 to the region of the body portion 120 remote from the portion 121.

As for the seat supporting members, the end of the body portion 120 remote from the portion 121 is formed as a split clamping portion 126 within which there is a receiving formation 127 of cross sectional shape corresponding to the tubular portion 82 or 85 of the cross-brace member. A clamping device 128 engaging the exterior of the clamping portion 126 is shown in situ in Figure 10 and removed therefrom in Figure 11. The clamping device comprises a metal band 129 whose main part 130 is part circular in configuration to embrace approximately two thirds of the external circumference of the portion 126, and whose free ends approach one another and have apertures 131 in which are engaged lugs 132 on an abutment member 133. A clamping screw 134 has screw-threaded engagement with the abutment member 133 and has a shoulder 135 followed by a nose portion 136 which passes through an aperture 137 in a pressure member 138 interposed between the abutment member 133 and the clamping portion 126 and shaped to cooperate with the part-circular external contour of the latter. The nose portion 136 further extends through aperture 139 in portion 126 and into an appropriately positioned aperture in the tube member received therein. The nose portion 136 thus acts as a locating element providing correct positioning of the pivot member relative to the tubular portion of the cross-brace member, and additional security of the connection beyond the clamping of the tubular

portion within the clamp portion 126 when the clamping screw 134 is tightened.

Stepwise adjustment of the length of each of the cross-brace members is achieved by providing the tubular portion of each cross-brace member with a number of apertures for engagement by fasteners as 134, where each tubular portion is connected to the respective pivot member and/or seat supporting member. Such adjustment enables the width of the wheelchair to be altered, within the limits imposed by the overall sizes of the component parts.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A structural assembly comprising an elongate member engaged in a receiving formation of a receiving member, wherein said elongate member has an external cross-sectional shape which is non-circular and includes circumferentially spaced portions of a circumscribing circle, and the receiving formation is of an internal cross-sectional shape which cooperates at least with the remaining portions of said external cross-sectional shape of the elongate member, to prevent relative movement between the receiving member and elongate member about the longitudinal axis of the latter.

2. A structural assembly according to Claim 1 wherein the external cross-sectional shape of the elongate member and internal cross-sectional shape of the receiving formation are the same as one another.

3. An assembly according to Claim 1 or Claim 2 wherein said external cross-sectional shape of the elongate member comprises a square but having its corners replaced by said circular portions.

4. An assembly according to any one of the preceding claims further comprising fastening means fastening said members together.

5. An assembly according to Claim 4 wherein said fastening means comprises a fastener extending transversely through the receiving formation and the elongate member.

6. An assembly according to Claim 4 wherein said fastening means comprises clamping means embracing a part of the receiving member to clamp the elongate member in said receiving formation.

7. An assembly according to Claim 6 further comprising a locating element engaging the receiving member and elongate member to position them relative to one another.

8. An assembly according to Claim 7 wherein said locating element is part of or associated with said clamping means, and extends inwardly therefrom through said receiving member to engage the elongate member.

9. An assembly according to Claim 8 wherein said elongate member has a plurality of said formations, to provide for adjustment of the position of the elongate member relative to the receiving member.

10. An assembly according to any one of the preceding claims further comprising a member angularly movable about the longitudinal axis of the elongate member, being received on the elongate member and engaging said circular portions thereof.

11. A wheelchair including at least one assembly according to any one of the preceding claims.

12. A wheelchair according to Claim 11 which comprises two side frame structures which carry the wheels of the chair, each side frame structure including an upper rail member and a lower rail member extending forwardly and rearwardly of the wheelchair and wherein said at least one assembly is provided between one or more of said rail members constituting said elongate member and a member or members joining said rail members at front and/or rear of the wheelchair, constituting said receiving members.

13. A wheelchair according to Claim 11 which comprises two side frame structures which carry the wheels of the chair, each side frame structure including an upper rail member and a lower rail member extending forwardly and rearwardly of the wheelchair and wherein said at least one assembly is provided between one or more of said rail members constituting said elongate member and a member or members joining said rail members at front and/or rear of the wheelchair, constituting said receiving members and a cross-brace assembly including first and second cross-brace members pivotally connected to one another between their ends by a pivot means, each of the cross-brace members being pivotally connected at a lower end with a respective side frame lower rail member and being connected at an opposite upper end with a seat supporting member, and respective links pivotally connected between the cross-brace members and respective upper rail members of the side frame structures, and wherein at least one of said assemblies is provided in each cross-brace member.

14. A structural assembly comprising an elongate member engaging in a receiving formation of a receiving member, and clamping means embracing said receiving member to clamp the elongate member in said receiving formation, wherein said clamping means includes a locating element cooperating with respective formations in the elongate member and receiving member to position the elongate member in the direction of its length relative to the receiving member.

15. A structural assembly according to Claim 14 wherein said formations comprise an aperture in the receiving member and an aperture or recess in the elongate member, said locating element extending radially inwardly through the aperture in the receiving member to engage the recess or aperture in the elongate member.

16. A structural assembly according to Claim 15 wherein there is a row of said formations in the elongate member, spaced lengthwise thereof to permit adjustability in the position of the elongate member relative to the receiving member.

17. A structural assembly according to any of Claims 14 to 16 wherein the locating element comprises a nose portion of a fastener by which the clamping means is tightened.

18. A cross-brace member for a wheelchair incorporating at least one structural assembly according to any one of Claims 14 to 17 provided between an elongate member constituting a part of the cross-brace member pivotally connected to another cross-brace member in use and a seat supporting member and/or a pivot member constituting the receiving member.

19. A wheelchair comprising two side frame structures which carry the wheels of the chair, each side frame structure including an upper rail member and a lower rail member extending forwardly and rearwardly of the wheelchair, and a cross-brace assembly including first and second cross-brace members each according to Claim 18, each cross-brace member having its pivot member pivotally engaged with a respective side frame lower rail member, having a seat supported by its seat supporting member, and further comprising respective links pivotally connected between the cross-brace members and respective upper rail members of the side frame structures.

20. A structural assembly, or a wheelchair incorporating same, substantially as hereinbefore described with reference to the accompanying drawings.

21. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

1/11

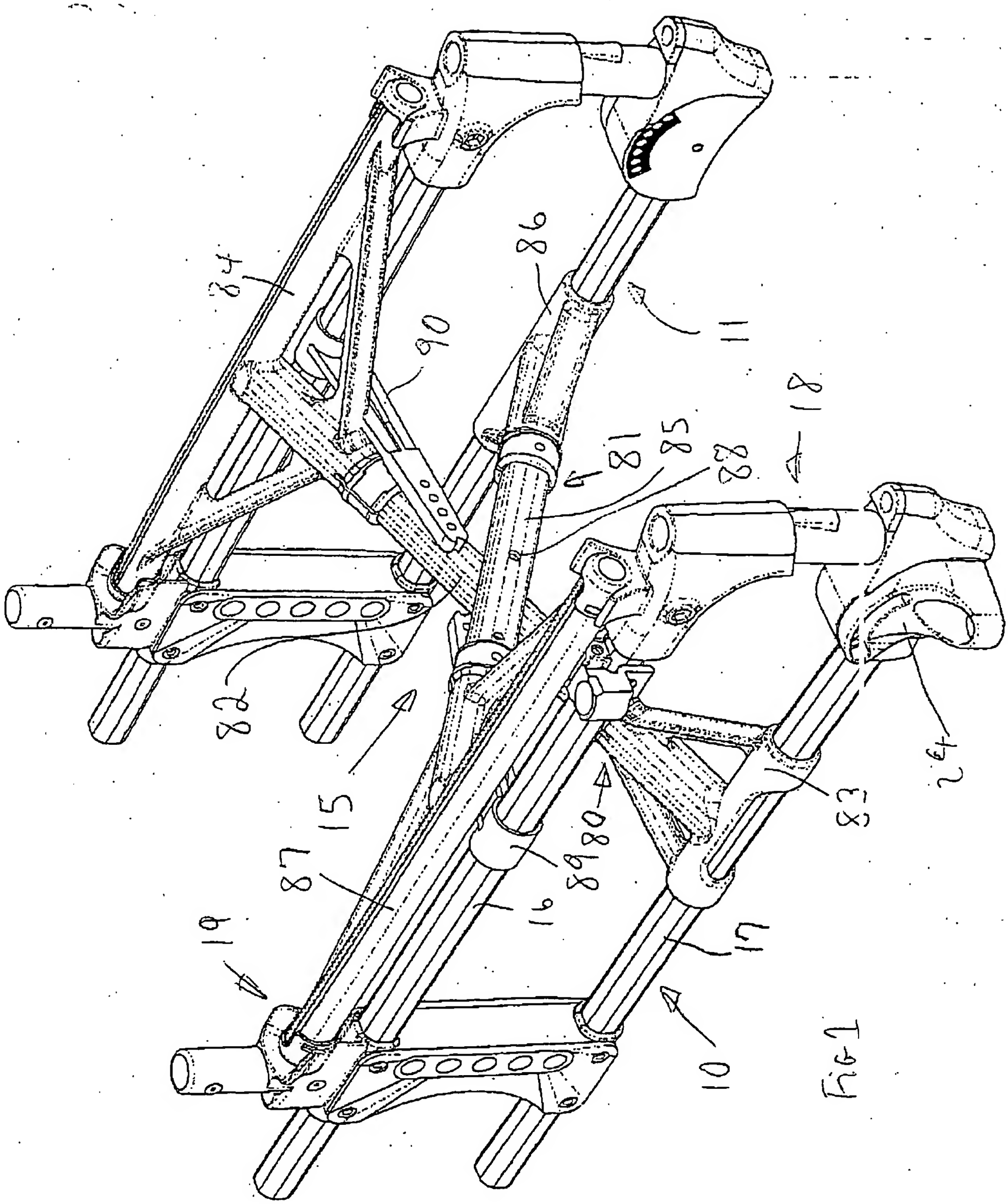


Fig 1

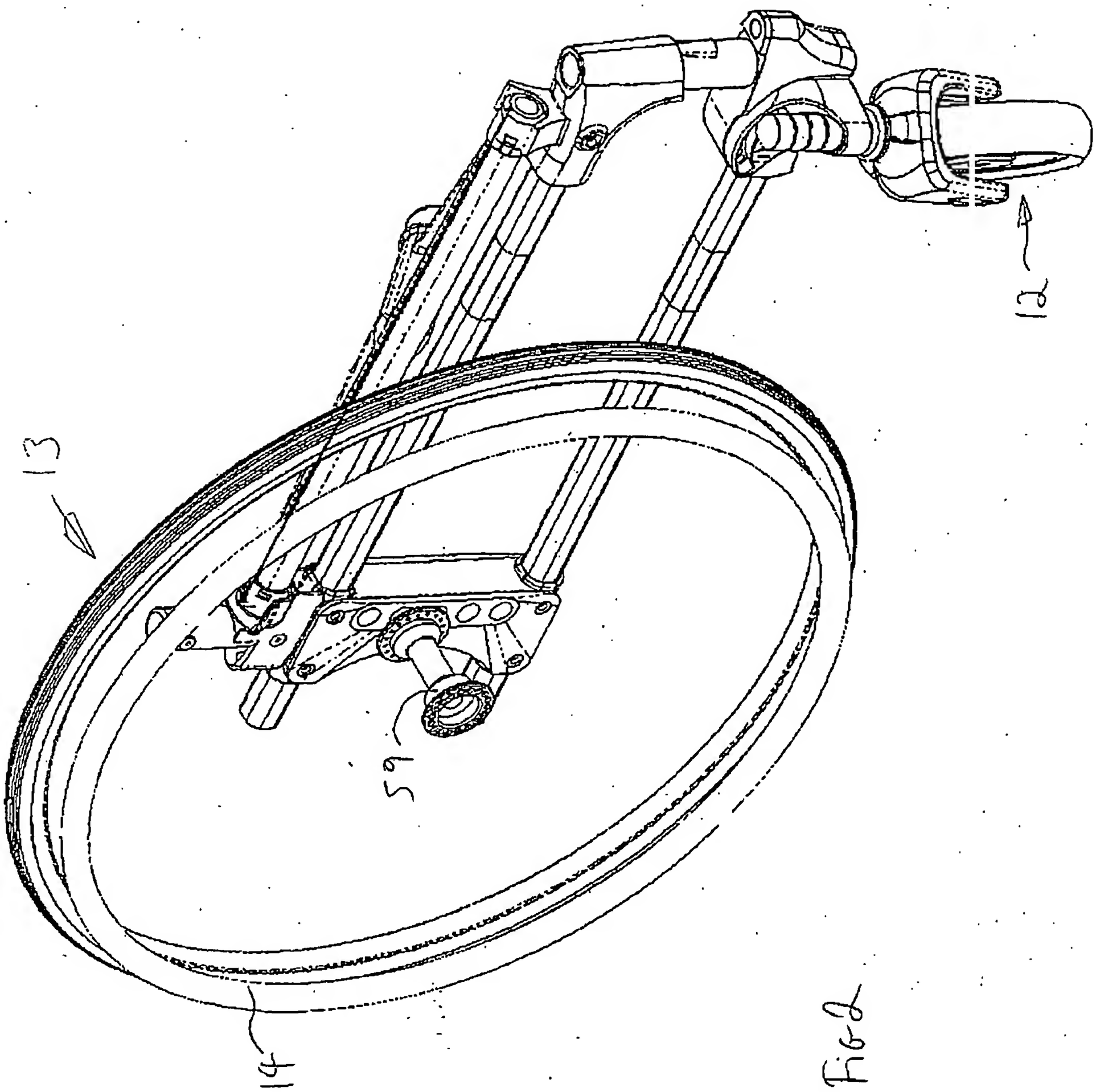


Fig 6

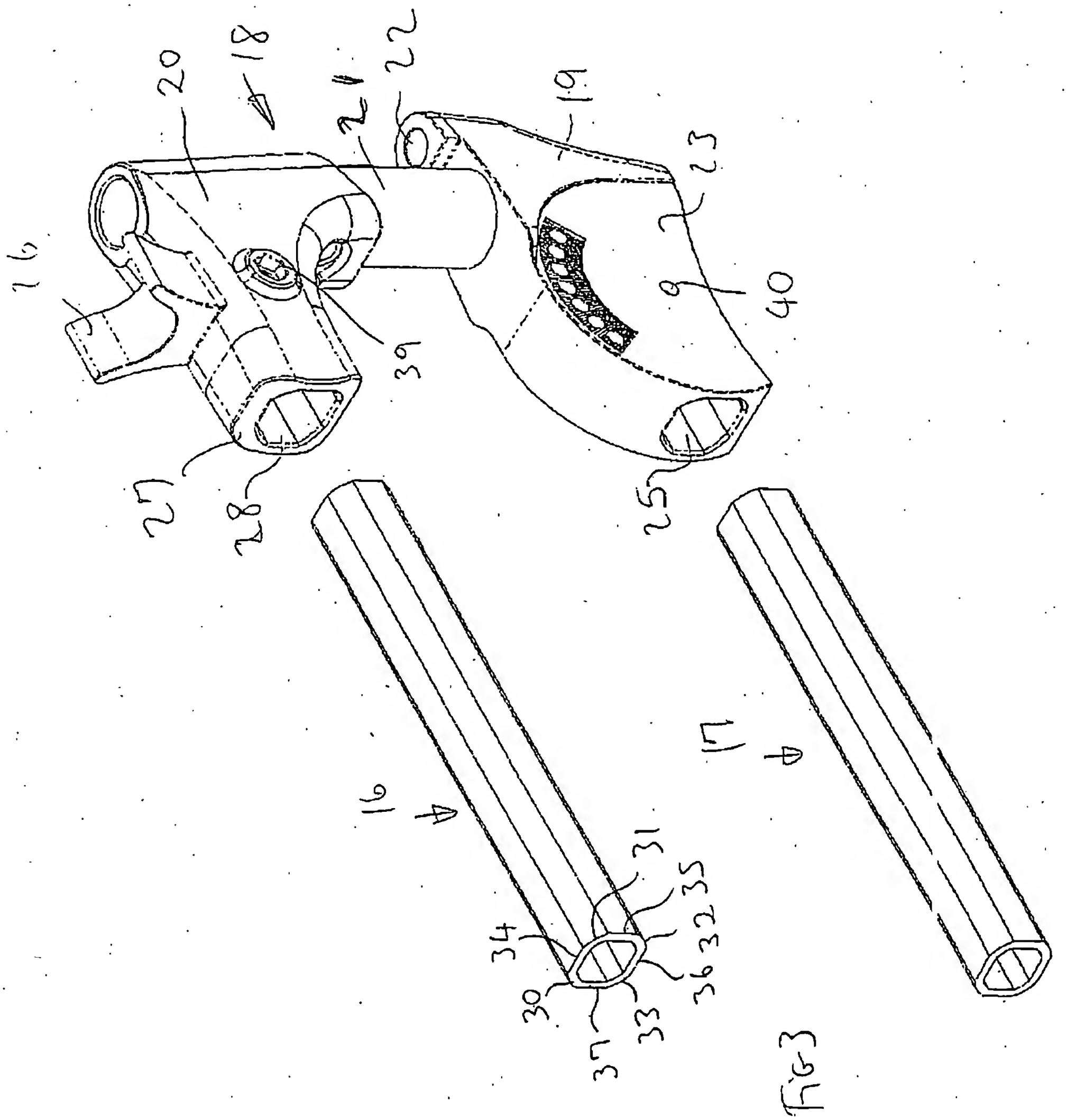


FIG 3

4/11

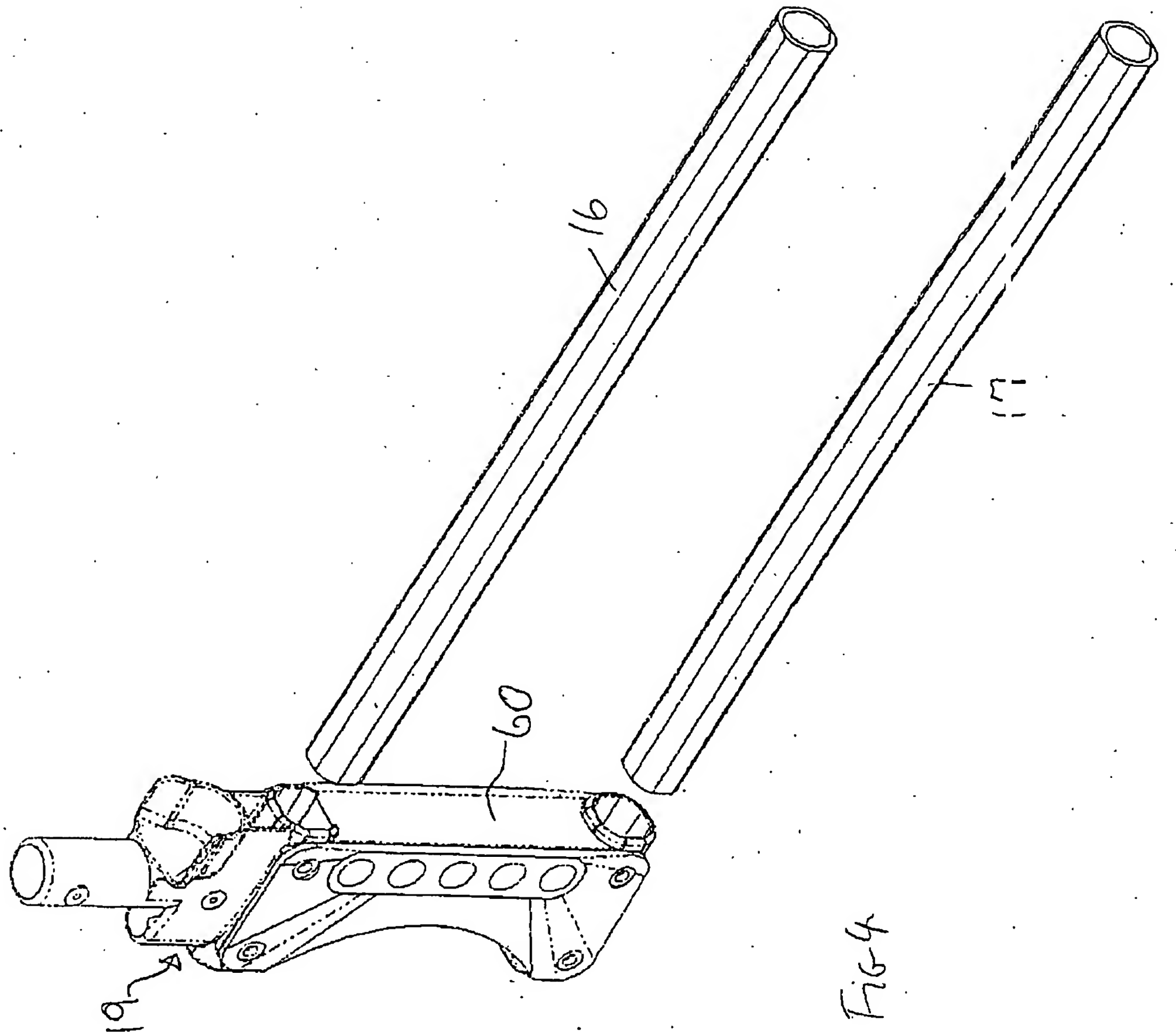


Fig 4

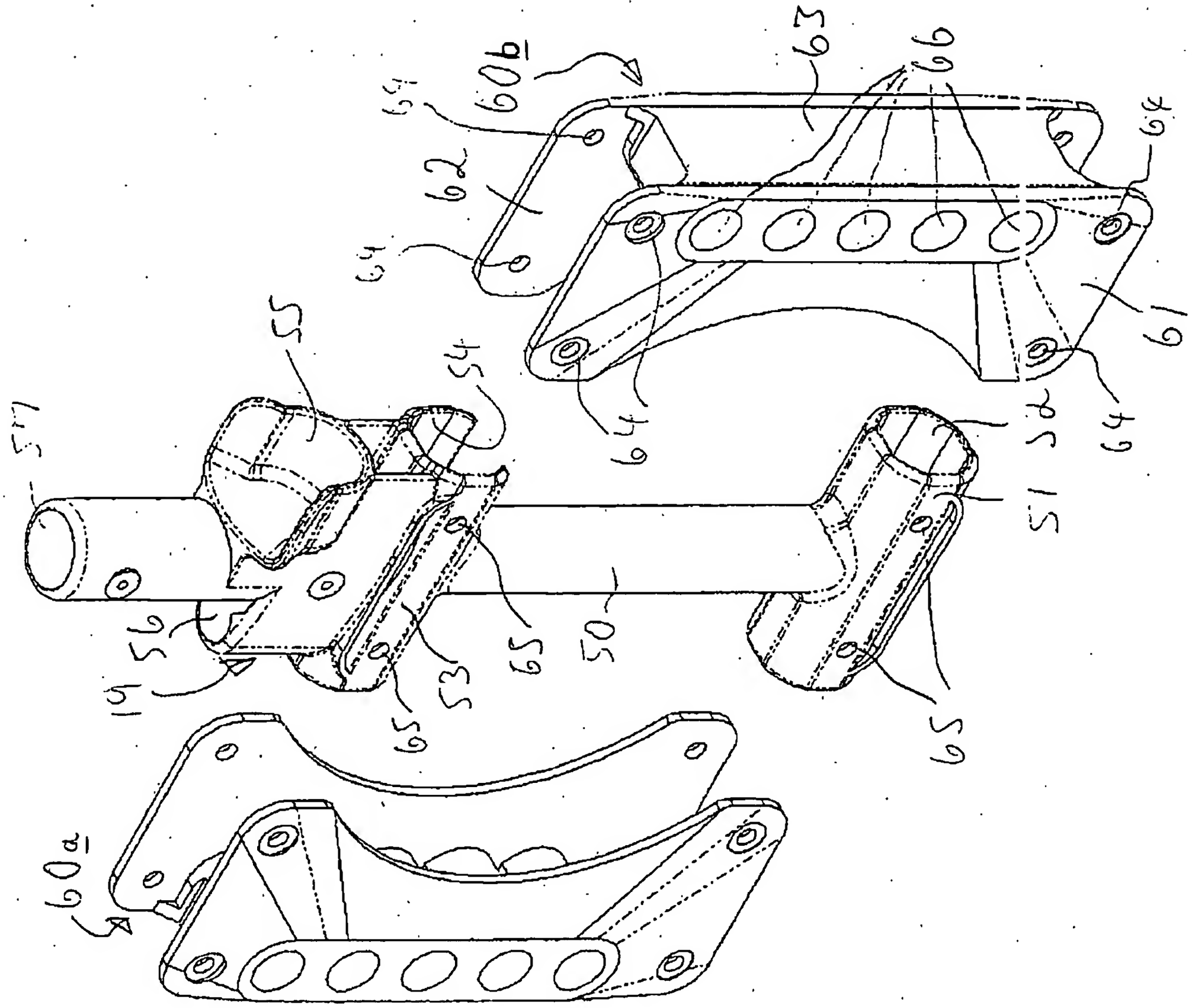


FIG. 5

6/11

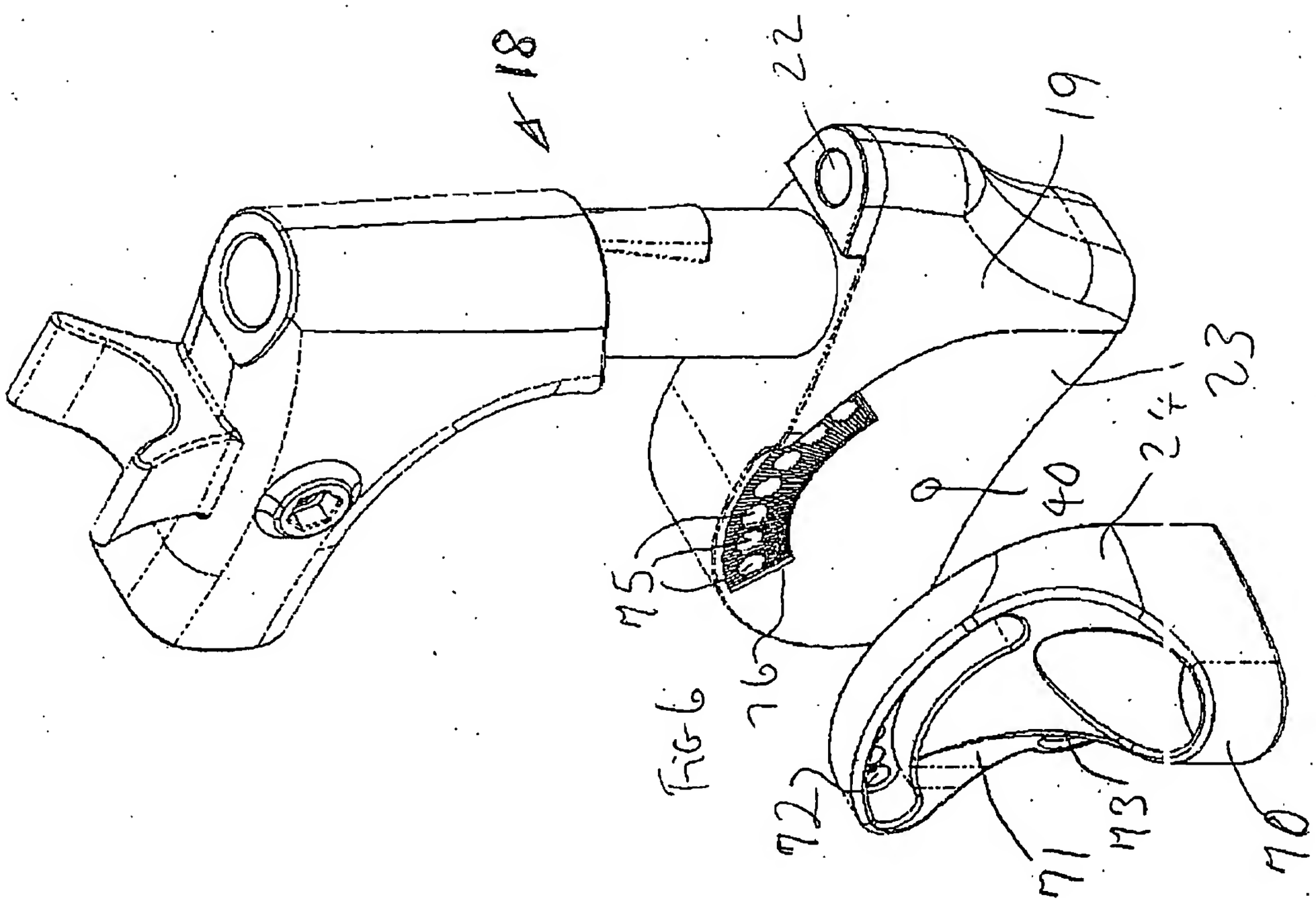
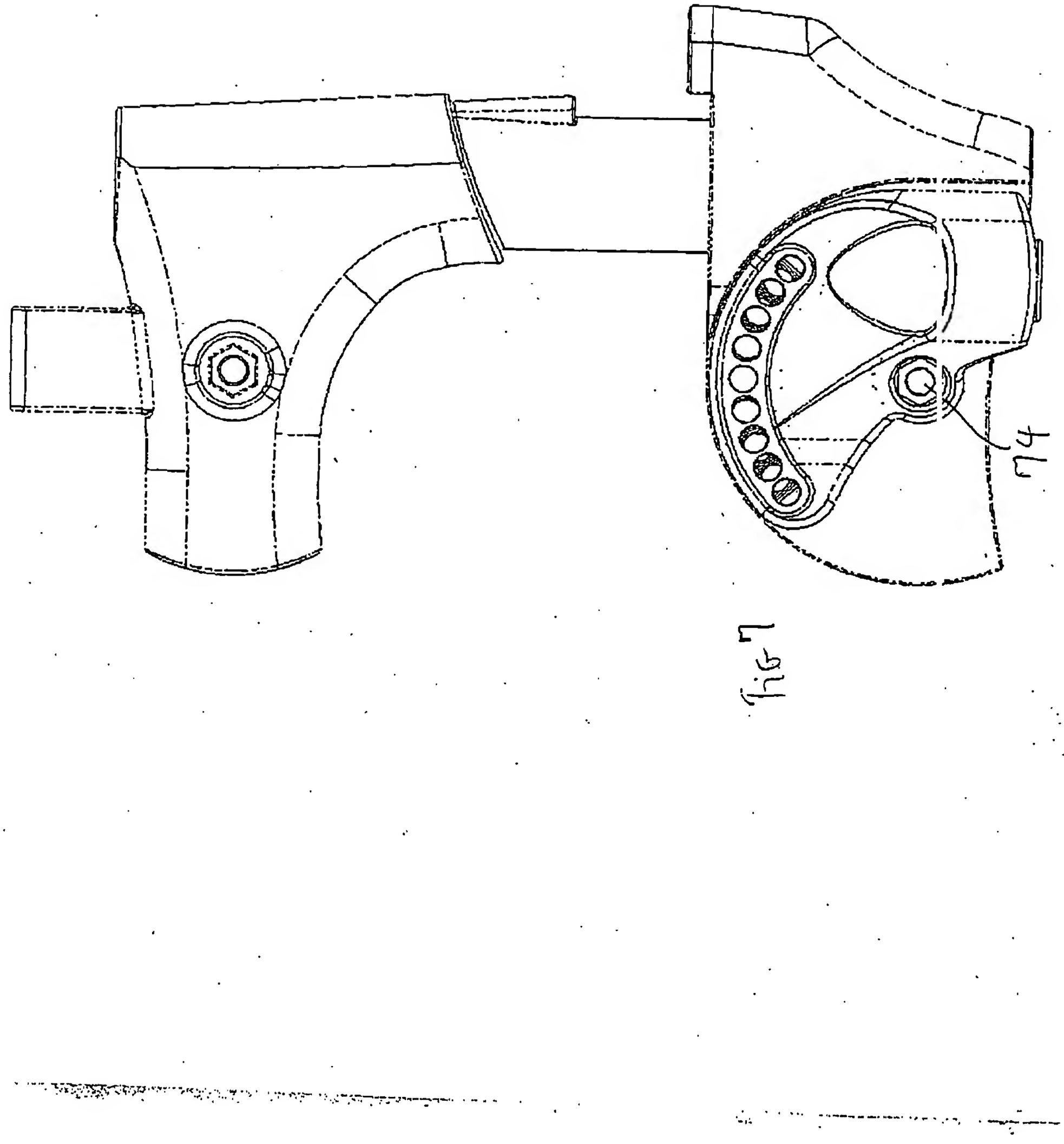


Fig 6

7/11



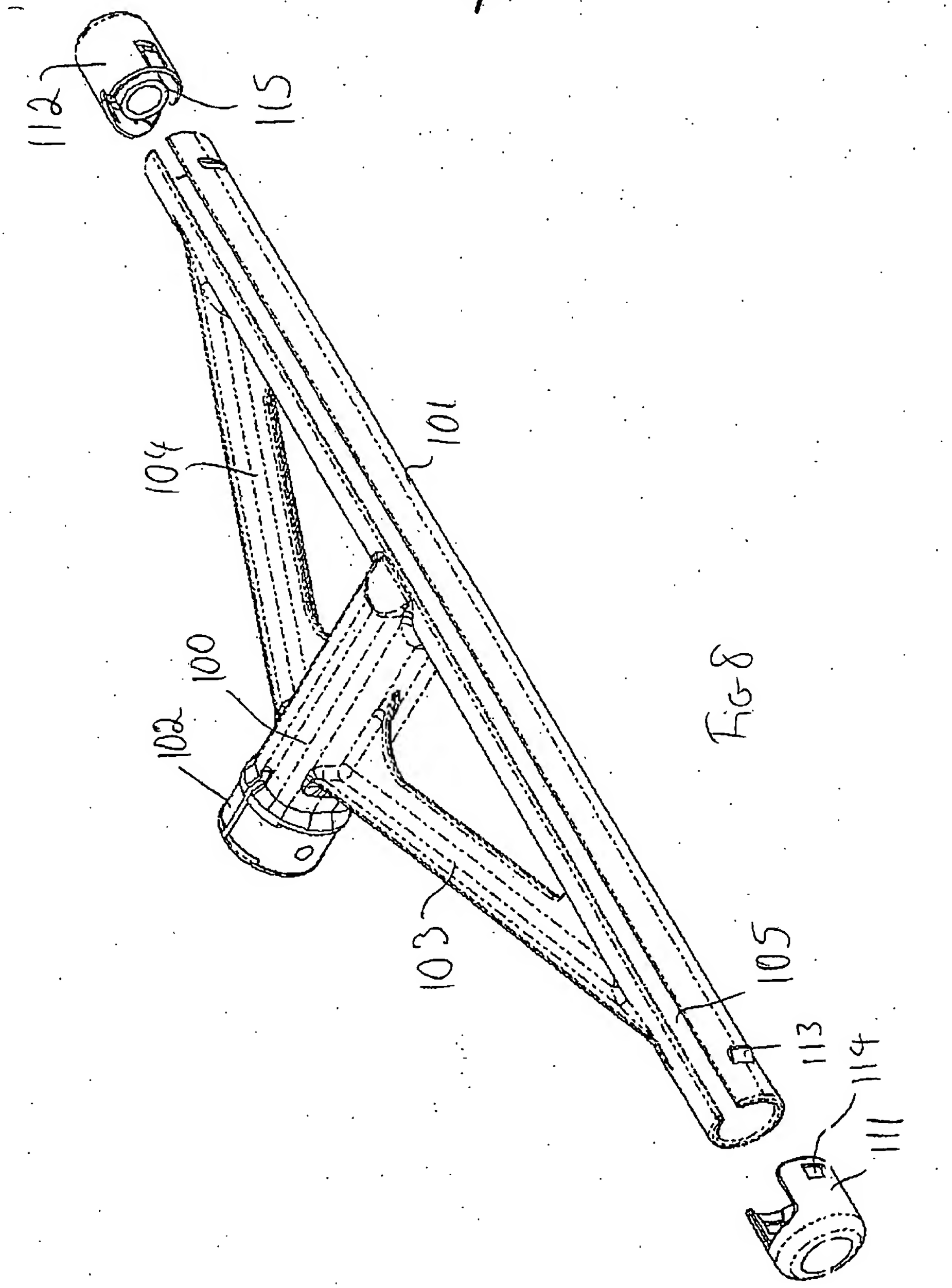
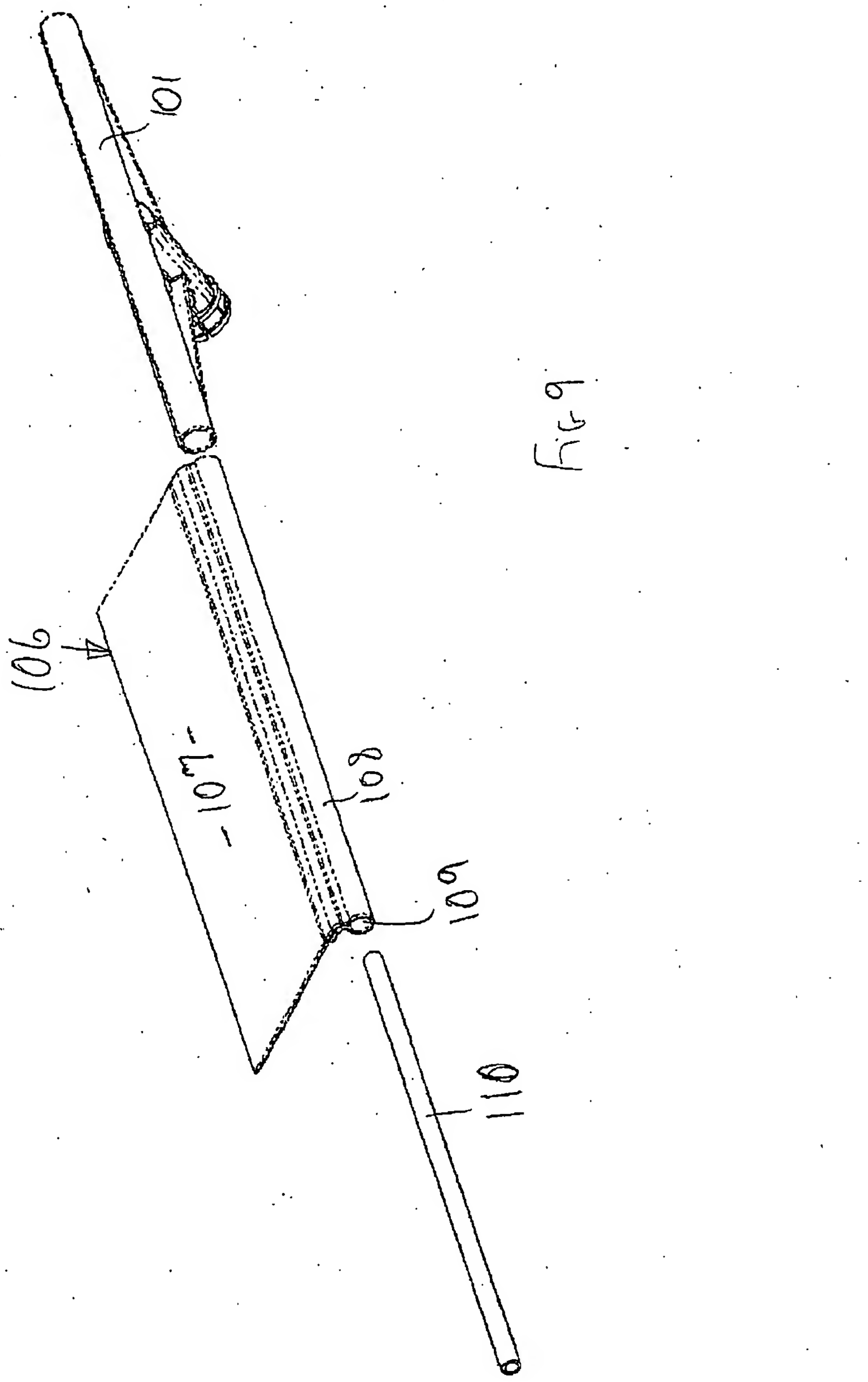


Fig 8

9/11



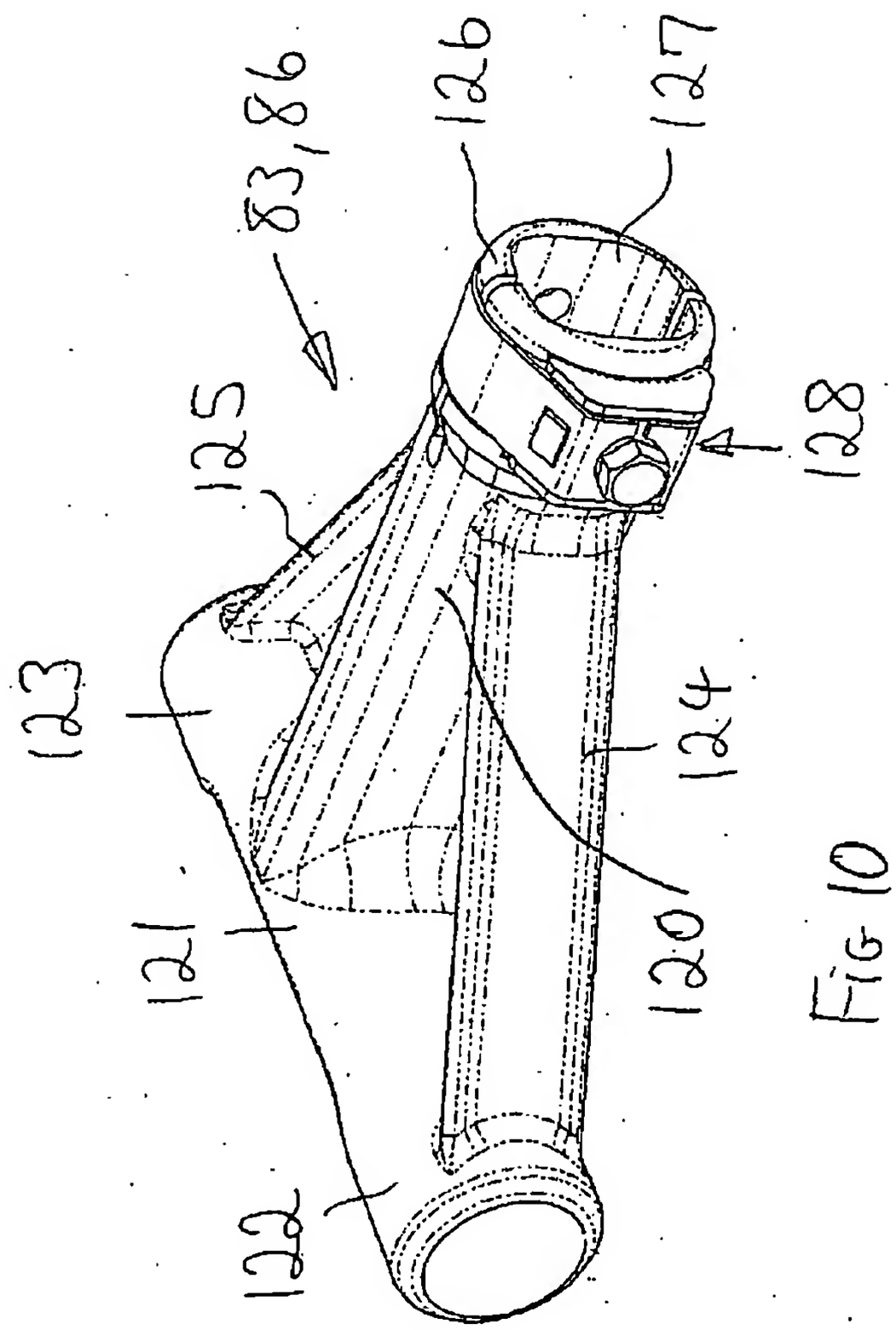


FIG 10

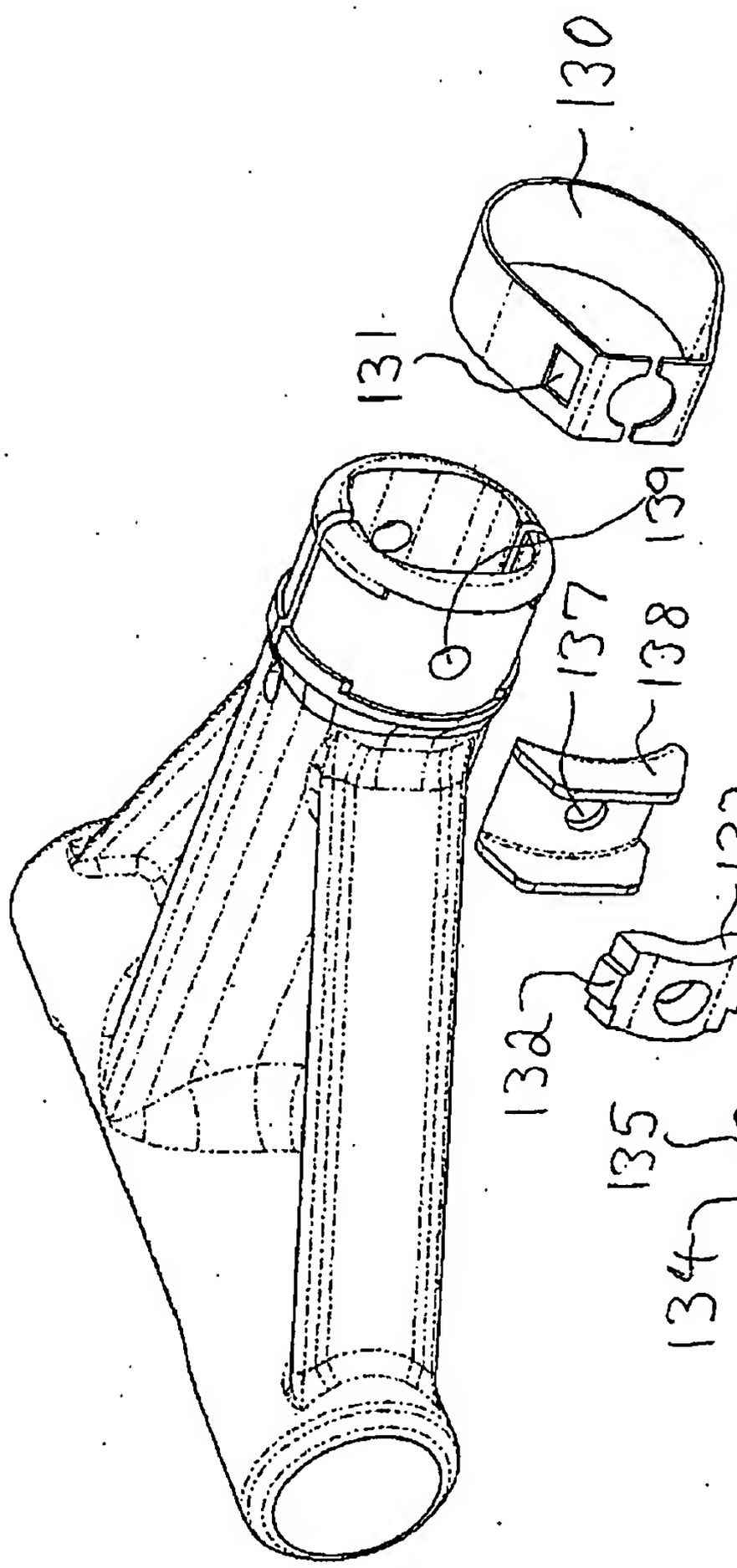


Fig 11